UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/771,813	02/03/2004	Xueshi Yang	S01.12-1013/STL 11469.00	3979

27365 7590 03/03/2008

SEAGATE TECHNOLOGY LLC C/O WESTMAN
CHAMPLIN & KELLY, P.A.
SUITE 1400
900 SECOND AVENUE SOUTH
MINNEAPOLIS, MN 55402-3319

EXAMINER	
TRAN, KHAI	

ART UNIT	PAPER NUMBER
2611	

MAIL DATE	DELIVERY MODE
03/03/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/771,813	YANG ET AL.	
	Examiner	Art Unit	
	KHAI TRAN	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11, 13-16* is/are rejected.

7)☒ Claim(s) *12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/17/2007 has been entered. Claims 1-16, 30 are pending in this Office action.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 6, 7, 11, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view Haunstein et al. (2003/0142740).

Regarding claim 1, Rouphael discloses a method of decoding data comprising: receiving a signal comprising a plurality of bit patterns at a bank of equalizers (figure 1 - 3, paragraphs 2, 16), each equalizer in the bank of equalizers tuned to a bit pattern with a corresponding equalization target (figures 1 - 3, elements FeedbackEqualizers/Filters). Rouphael does not explicitly disclose equalizers tuned to a bit pattern with a corresponding equalization target, however, it is well known to one skilled in the art at the time of invention was made that equalizers are known to function

as being tuned to a bit pattern with a corresponding equalization target. This is done in order to accurately equalize the signal or signals. Applicant may refer to paragraph 56 of US 2006/0139646; abstract and paragraphs 5, 45, 48 of US 2004/0136717; col. 5 lines 6- 18 of US 7107514; col. 5 lines 41 - 45 of US 6810168; to show that one skilled in the art at the time of invention was made would know equalizers are known to function as being tuned to a bit pattern with a corresponding equalization target); generating pattern dependent outputs from the equalizers (figure 1, output of elements 20, 30, paragraph 18); and calculating an estimated bit sequence with a detector using the pattern dependent outputs (figure 1 element Decision Device, paragraphs 18, 22). Rouphael also discloses equalizers each tuned to a different bit pattern (paragraphs 18, 22); however, Rouphael is not expressly clear about "different bit pattern". Rouphael discloses that the first equalizer output a signal that represents the digital bit values and the second equalizer outputs a signal that represents an uncertainty of the decision made, and further that both equalizers operate slightly differently from each other.

In the same field of endeavor, however, Haunstein discloses equalizers each tuned to a different bit pattern (paragraphs 13, 17 and abstract; where Haunstein discloses this in a DFE equalization).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use equalizers each tuned to a different bit pattern as taught by Haunstein in the system of Rouphael to versatile adaptation.

Regarding claim 6, Rouphael further discloses wherein each equalizer includes an adaptive algorithm for tuning each equalizer to a bit pattern during use (paragraphs 24, 32, claims 10, 21, 31, 42).

Regarding claim 7, Rouphael discloses a method of decoding data comprising: processing a segment of a received signal in a bank of equalizers (figure 1 - 3, paragraphs 2, 16), each equalizer tuned to a bit pattern and an equalization target to produce an equalized output for each equalizer (figures 1 - 3, elements Feedback Equalizers/Filters, Rouphael does not explicitly disclose equalizers tuned to a bit pattern with a corresponding equalization target, however, it is well known to one skilled in the art at the time of invention was made that equalizers are known to function as being tuned to a bit pattern with a corresponding equalization target. This is done in order to accurately equalize the signal or signals. Applicant may refer to paragraph 56 of US 2006/0139646; abstract and paragraphs 5, 45, 48 of US 2004/0136717; col. 5 lines 6 - 18 of US 7107514; col. 5 lines 41 - 45 of US 6810168; to show that one skilled in the art at the time of invention was made would know equalizers are known to function as being tuned to a bit pattern with a corresponding equalization target); detecting a bit sequence using a branch metric calculation to process the equalized output (figure 1, output of elements 20, 30, Decision Device, paragraphs 18, 22). Rouphael also discloses equalizers each tuned to a different bit pattern (paragraphs 18, 22); however,

Rouphael is not expressly clear about "different bit pattern". Rouphael discloses that the first equalizer output a Signal that represents the digital bit values and the

second equalizer outputs a signal that represents an uncertainty of the decision made, and further that both equalizers operate slightly differently from each other.

In the same field of endeavor, however, Haunstein discloses equalizers each tuned to a different bit pattern (paragraphs 13, 17 and abstract; where Haunstein discloses this in a DFE equalization).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use equalizers each tuned to a different bit pattern as taught by Haunstein in the system of Rouphael to versatile adaptation.

Regarding claim 11, Rouphael discloses tuning each equalizer in the bank of equalizers to a bit pattern (figures 1 - 3, elements Feedback Equalizers/Filters,

Rouphael does not explicitly disclose tuning each equalizer in the bank of equalizers to a bit pattern, however, it is well known to one skilled in the art at the time of invention was made that tuning each equalizer, in the bank of equalizers to a bit pattern. This is done in order to accurately equalize the signal or signals. Applicant may refer to

paragraph 56 of US 2006/0139646; abstract and paragraphs 5, 45, 48 of US 2004/0136717; col. 5 lines 6 - 18 of US 7107514; col. 5 lines 41 -45 of US 6810168; to show that one skilled in the art at the time of invention was made would know tuning each equalizer in the bank of equalizers to a bit pattern).

Regarding claim 13, Rouphael discloses the branch metric calculation is a square of a difference between a received signal sample and a desired target signal determined by a state transition (paragraphs 18 - 28).

Claim Rejections - 35 USC § 103

4. Claims 2-3 rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al (US 2003/01308940) in view of Cideciyan et al (U.S. Pat. 6,460,150).

Regarding claim 2, Rouphael does not disclose the signal is received from a recording channel.

In the same field of endeavor, however, Cideciyan discloses the signal is received from a recording channel (figure 1, col. 3 lines 24 -41).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use the signal is received from a recording channel as taught by Cideciyan in the system of Rouphael to allow for processing in numerous types of systems.

Regarding claim 3, Rouphael does not disclose reading a sequence of signal samples from a channel; and passing segments of the sequence of signal samples to the bank of equalizers one segment at a time.

In the same field of endeavor, however, Cideciyan discloses reading a sequence of signal samples from a channel; and passing segments of the sequence of signal samples to the bank of equalizers one segment at a time (figure 1, col. 3 lines 24 - 67;

where the samples from an A/D converter would produce the one segment at a time, i.e. 8 bit A/D converter Would provide an 8 bit segment).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use reading a sequence of signal samples from a channel; and passing segments of the sequence of signal samples to the bank of equalizers one segment at a time as taught by Cideciyan in the system of Rouphael to proper processing (i.e. to avoid overflow).

Claim Rejections - 35 USC § 103

5. Claims 4 - 5, 9 - 10, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view of Moon, J. and Park, J. "Pattern-Dependent Noise Prediction in Signal-Dependent Noise" IEEE Journal on Selected Areas in Communications, vol. 19, no. 4, April 200l.

Regarding Claim 4, Rouphael does not disclose calculating a path metric for every possible state transition sequence of a bit pattern using the pattern dependent equalizer outputs according to transition information; and selecting a bit sequence c0rresponding to a path having the smallest accumulated path metric.

In the same field of endeavor, however, Moon discloses calculating a path metric for every possible state transition sequence of a bit pattern using the pattern dependent equalizer outputs according to transition information; and selecting a bit sequence corresponding to a path having the smallest accumulated path metric (Section I

paragraphs 1 - 2, Section II steps 1 - 3, Section III B paragraph 1, Section III C paragraph 2).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use calculating a path metric for every possible state transition sequence of a bit pattern using the pattern dependent equalizer outputs according to ransition information; and selecting a bit sequence corresponding to a path having the smallest accumulated path metric as taught by Moon in the system of Rouphael to provide better performance and reduce noise (Section IX).

14.

Regarding claims 5 and 14, Rouphael does not disclose each equalizer includes a pattern-dependent filter.

In the same field of endeavor, however, Moon discloses each equalizer includes a pattern-dependent filter (Section I).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use each equalizer includes a pattern-dependent filter as taught by Moon in the system of Rouphael to provide better performance and reduce noise (Section IX).

Regarding claim 9, Rouphael does not disclose the equalized output is used in sequence detection according to the bit pattern associated with the equalizer.

In the same field of endeavor, however, Moon discloses the equalized output is used in sequence detection according to the bit pattern associated with the equalizer (Section I).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use the equalized output is used in sequence detection according to the bit pattern associated with the equalizer as taught by Moon in.the system of Rouphael to provide better performance and reduce noise (Section IX).

16. Regarding claim 10, Rouphael does not disclose a number of equalizers in the bank of equalizers is determined by a maximum number of possible states for a selected pattern window.

In the same field of endeavor, however, Moon discloses a number of equalizers in the bank of equalizers is determined by a maximum number of possible states for a selected pattern window (Section I paragraphs 1 - 2, Section II steps 1 - 3, Section III B paragraph 1, Section III C paragraph 2).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use a number of equalizers in the bank of equalizers is determined by a maximum number of possible states for a selected pattern windowas taught by Moon in the system of Rouphael to provide better performance and reduce noise (Section IX).

Claim Rejections - 35 USC § 103

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view of Kwon et al. (US 2004/0156459).

Regarding claim 8, Rouphael is not explicit about dividing the segment of the received signal into finite overlapped segments, and calculating an equalized output for each of the finite segments with the bank of equalizers.

In the same field of endeavor, however, Kwon discloses dividing the segment of the received signal into finite overlapped segments, and calculating an equalized output for each of the finite segments with the bank of equalizers (paragraphs 53, 61, 67).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use dividing the segment of the received signal into finite overlapped segments, and calculating an equalized output for each of the finite segments with the bank of equalizers as taught by Kwon in the system of Rouphael to save on processing power.

Claim Rejections - 35 USC § 103

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view of Ojard et al. (US 2005/0031061).

20. Regarding claim 15, Rouphael is not explicit about the branch metric calculation is based on a noise whitening principle when noise in the received signal is correlated (the branch metric calculation is based on a noise whitening principle: paragraphs 16 - 17, 37).

In the same field of endeavor, however, Ojard discloses the branch metric calculation is based on a noise whitening principle when noise in the received signal is correlated (paragraph 115).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use the branch metric calculation is based on a noise whitening principle when noise in the received signal is correlated as taught by Ojard in the system of Rouphael to reduce the noise power (paragraph 115).

Claim Rejections - 35 USC § 103

8. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view of Linnartz et al. (US 2002/0181549).

Regarding claim 16, Rouphael is not explicit about the branch metric calculation is based on a covariance matrix of noise when noise in the received signal is correlated.

In the same field of endeavor, however, Ojard discloses the branch metric calculation is based on a covariance matrix of noise when noise in the received signal is correlated (paragraph 6).

Therefore it would have been obvious to one skilled in the art at the time of " invention was made to use the branch metric calculation is based on a covariance matrix of noise when noise in the received signal is correlated as taught by Ojard in the system of Rouphael to reduce the complexity (paragraph 6).

Allowable Subject Matter

9. Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lui et al (US 2004/0091069 A1) disclose a timing recovery system and method.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KHAI TRAN whose telephone number is (571) 272-3019. The examiner can normally be reached on 7:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KHAI TRAN
Primary Examiner
Art Unit 2611

KT
February 28, 2008